

Total Maximum Daily Load (TMDL) Program



Note: This information is provided for reference purposes only. Although the information provided here was accurate and current when first created, it is now outdated.

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Federal Advisory Committee on Total Maximum Daily Loads (TMDLs)

November 19-21, 1996
TMDL FACA Committee Meeting
in Herndon, VA

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Total Maximum Daily Load (TMDL) Program



TMDL Overview

This overview contains general information about the TMDL program (and related programs), presented in the form of responses to commonly asked questions.

1. What Does the Clean Water Act Say About TMDLs?

The TMDL Advisory Committee will be considering implementation of Section 303(d) of the Clean Water Act (see TAB 7). That Section covers not only development of TMDLs, but also several directly related activities. Generally, Section 303(d) provides that:

- States and authorized Tribes are to list waters for which point source technology-based limits alone do not assure attainment of water quality standards;
- States and authorized Tribes are to set priority rankings for the waters listed, taking into account the severity of the pollution and intended uses of the waters;
- In accordance with the priority ranking, States and authorized Tribes are to establish total maximum daily loads (TMDLs) that will meet water quality standards for each listed water, considering seasonal variations and a margin of safety that accounts for uncertainty;
- States and authorized Tribes are to submit their lists and TMDLs to EPA for approval and, once EPA approves them, are to incorporate these items into their continuing planning processes; and
- If EPA disapproves a State or Tribal list and/or TMDL, EPA must (within 30 days of disapproval and allowing for public comment) establish the list and/or TMDL for the State or Tribe and the State or Tribe is then to incorporate EPA's action into its continuing planning process.

2. What is a Section 303(d) List?

EPA has issued regulations and guidance elaborating on the statutory requirement for State and Tribal Section 303(d) lists. (See TABs 8 and 9.) The most important provisions of the regulations and guidance pertaining to the listing process are described in Background Paper #1, Listing of Impaired Waters, which follows this Overview.

Generally, Section 303(d) lists are to be submitted to EPA in April of every even-numbered year and must identify waters not meeting (or not expected to meet) water quality standards after implementation of existing and scheduled controls.

Historically, the listing requirements of 303(d) were not implemented on a regular schedule. Section 303(d) merely provides for States to submit lists to EPA "from time to time". In the last seven or eight years, however, EPA and States have increased emphasis on TMDL activities. Regulations that became effective in 1992 required lists to be submitted on a biennial basis. The increasing emphasis on identifying and targeting impaired waters is consistent with the increased attention to watershed programs that is gradually replacing the water program's historical focus on point source technology-based controls.

3. What is a Total Maximum Daily Load (TMDL)?

The precise definition of or requirements for a TMDL may be an issue for the Committee to consider. See [Background Paper #2, Criteria for EPA Approval of State/Tribal TMDLs](#) for a discussion of the current requirements and EPA guidance on what constitutes a TMDL.

Generally, a TMDL is a means for recommending controls needed to meet water quality standards in a particular water or watershed. Water quality standards are ordinarily broadly applicable to many waters; TMDLs contain specific goals for a given water or watershed. Establishing a TMDL is a very important step in watershed protection because it sets quantified goals for water quality conditions that may then determine what actions are needed to restore or protect the health of the waterbody. In fact, a TMDL has been described as the technical backbone for watershed protection.

Current EPA regulations (see 40 CFR §130.2(i), in TAB 8) define a TMDL in part as:

"The sum of the individual wasteload allocations (WLAs) for point sources and load allocations (LAs) for nonpoint sources and natural background. . . . TMDLs can be expressed in terms of either mass per time, toxicity, or other appropriate measure."

In accordance with Section 303(d), TMDLs must also include a margin of safety to account for uncertainty. EPA guidance (see TAB 9) also suggests other important considerations in developing a TMDL. For example, anticipated future growth in loadings from both point and nonpoint sources may be considered.

If a TMDL is based on a narrative standard, then a quantified endpoint needs to be developed in order to calculate the TMDL. For example, if the narrative standard being violated or threatened is "no toxics in toxic amounts", the specific toxic pollutants of concern may need to be identified and targets established at levels that would assure no toxic effects on humans or wildlife/aquatic life. TMDL development may be based on existing data and simple analytical tools or may require additional and more extensive data and complex modeling.

TMDLs are not self-implementing or directly enforceable against sources in the watershed.

Rather, they are implemented through other Clean Water Act mechanisms and other federal, State, Tribal and/or local authorities, such as point source discharge permits, federal land management plans, State nonpoint source programs and local zoning programs.

Historically, the typical TMDL has been developed as a wasteload allocation, considering a particular waterbody segment, for a particular point source, in order to support setting effluent limitations in that point source's National Pollutant Discharge Elimination System (NPDES) discharge permit. This approach has produced significant improvements in water quality by establishing point source controls for particular chemical pollutants. However, problems do remain. Some point sources need additional controls and many nonpoint source impacts (from agriculture, forestry, development activities, etc.) are causing or contributing to impairments in water quality. In order to address the combined, cumulative impacts of all of these sources, the watershed protection approach (WPA) is becoming the preferred focus for achieving water quality goals. To support the WPA, TMDLs are needed on a broader geographic basis and need to address all sources in the watershed, including point and nonpoint sources, air deposition, effects from contaminated bottom sediments, and groundwater flows into the surface water, depending on the causes of water quality impairment in the watershed.

4. What Regulations has EPA Issued to Implement Section 303(d)?

EPA's regulations for implementing Section 303(d) are codified in the Water Quality Planning and Management Regulations at 40 CFR Part 130, specifically at §130.2, §130.7 and §130.10. (See TAB 8. Aspects of these regulations are also discussed in the Background Papers that follow.) The regulations define terms used in Section 303(d) and otherwise interpret and expand upon the statutory requirements.

Generally, the regulations provide for States and authorized Tribes to identify waters not meeting water quality standards for which existing control requirements for point and nonpoint sources are not stringent enough to achieve standards. In preparing lists, States and Tribes must consider all aspects of their water quality standards, including designated beneficial uses, numeric and narrative criteria to protect uses, and antidegradation policies. States and Tribes must consider thermal (heat-related) impairments as well as other types of water quality stressors.

Each State/Tribal list is to include:

- a priority ranking as required by Section 303(d), along with an identification of waters targeted for TMDL development in the upcoming two-year cycle; and
- an identification of the pollutants causing or expected to cause a violation of standards for each listed water.

States/Tribes are to consider all existing and readily available data in compiling their lists and are to document their listing decisions with descriptions of decision methodologies and the data they used. Beginning in 1992, States and authorized Tribes are to submit their lists every two years. Beginning in 1994, lists were due to EPA on April 1 of each even-numbered year.

The regulations also require each State to develop TMDLs, in accordance with their priority ranking, at levels needed to achieve water quality standards (with seasonal variations), including a margin of safety to account for uncertainties in the relationship between effluent limitations and water quality. TMDLs may be pollutant-by-pollutant, based on biomonitoring, or both.

EPA's Regional Offices are responsible for approving or disapproving State and Tribal Section 303(d) lists and TMDLs, and for establishing lists and TMDLs in case of disapproval. Public participation is to be provided for by States and Tribes (or EPA Regional Offices, in the case of disapproval) when they establish lists or TMDLs.

5. What Guidance has EPA Issued to Help States and Tribes Implement Section 303(d)?

The most important national programmatic guidance documents issued by EPA are described below. Copies of these documents are included in TABs 9 and 10 of this packet. (Note that EPA Regional Offices may also issue guidance for use by States and Tribes in their region and that EPA has also issued various technical documents relevant to TMDL development, such as information on predictive models.)

- **April 1991:** Guidance for Water Quality-based Decisions: The TMDL Process.
 1. Summarizes the purpose and basic requirements of Section 303(d) and implementing regulations.
 2. Describes the water quality-based approach generally as providing a mechanism for pollution control based on the intrinsic conditions of a waterbody and the standards set to protect it, in accordance with the following steps:
 - identification of water quality-limited waters still requiring TMDLs;
 - priority ranking and targeting;
 - TMDL development;
 - implementation of control actions; and
 - assessment of water quality-based control actions.
 3. Describes the TMDL development process. Discusses TMDLs developed using the "phased" approach in cases of high uncertainty. The phased TMDL approach allows for a TMDL to be developed based on the best available information, along with a schedule for implementing and evaluating control actions and assessing whether water quality standards have been attained. The TMDL may then need to be revised in accordance with the findings of the assessment.

Describes how NPDES permits implement controls for point sources (waste load allocations) and suggests that state and local authorities be used for nonpoint sources.
 4. Outlines the roles of States and EPA. Appendices to the 1991 Guidance include:

- a characterization of the relationship of the guidance to other guidance documents;
 - a description of EPA programs that relate to or support the TMDL program;
 - suggested minimum screening categories of waters States should consider when developing a list of water quality-limited waters;
 - suggested technical considerations when developing a TMDL;
 - a description of available mathematical model support;
 - a general EPA/State agreement outline for developing TMDLs; and
 - a list of causes and sources of water pollution.
- **August 13, 1992.** Supplemental Guidance on Section 303(d) Implementation. Memorandum from Geoffrey Grubbs, Director, Assessment and Watershed Protection Division, to Water Quality Branch Chiefs and TMDL Coordinators, EPA Regions I-X.
 1. Describes which water quality-limited waters require TMDLs and therefore should be included in Section 303(d) list.
 2. Describes priority ranking and targeting approaches for listed waters, including the need to include waters with impairments that are difficult to address and State/EPA cooperation in developing scheduled TMDLs.
 3. Discusses when EPA approval, disapproval, or conditional approval of State lists is appropriate, along with documentation and administrative requirements of the approval process.
 4. Describes how EPA will respond if a State does not submit a Section 303(d) list.

An attachment to the memorandum contains answers to questions raised in Regional Workshops regarding various aspects of the TMDL listing and development process.

- **October 30, 1992.** Approval of 303(d) lists: Promulgation Schedules/Procedures, Public Participation. Memorandum from Geoffrey Grubbs, Director, Assessment and Watershed Protection Division, to Water Quality Branch Chiefs, Regions I-X.
 1. Clarifies due dates for the first (1992) biennial list submittals.
 2. Reviews internal EPA delegation of authority for approving/disapproving State Section 303(d) submittals, as well as certain procedural and documentation requirements.
 3. Reviews the internal EPA process and overall plan for addressing circumstances where States do not meet the October 22, 1992 submittal deadline.

4. Advises EPA Regions on how to proceed when 1992 State 303(d) lists were submitted without completing public participation procedures; reviews public participation requirements for 1994 lists.
- **November 26, 1993.** *Guidance for 1994 Section 303(d) lists.* Memorandum from Geoffrey Grubbs, Director, Assessment and Watershed Protection Division, to Water Management Division Directors and Regional TMDL Coordinators, Regions I-X.

Discusses minimum requirements for 1994 list submittals. Identifies three broad national TMDL program goals for 1994 and clarifies aspects of the TMDL program in light of these goals.

Goal #1: Develop fully approvable Section 303(d) lists.

- Addresses situations when impaired waterbodies need not be listed where TMDLs have not been completed but enforceable controls/management activities are expected to attain water quality standards in the near future. Suggests that "near future" could be due date for the next Section 303(d) list or date compliance is required in existing NPDES permit.
- Reaffirms 1991 guidance requiring that threatened waters must be listed.
- Suggests use of existing and readily available data (including biological data) and best professional judgment in listing decision.
- States that Section 303(d) lists should be consistent with other lists and assessments and that unassessed waters should not be listed under Section 303(d).
- Clarifies due dates for submittal of lists and requests that submittals include brief status report on TMDL development activities.
- Explains EPA options for TMDL lists: approval, disapproval, conditional approval, and partial approval/disapproval.
- Explains that a State may remove a water from its list if the waterbody is meeting water quality standards or is expected to meet standards in a reasonable time with implementation of required controls, or if the original basis for listing is determined to be inaccurate.

Goal #2: Integrate listing into State program activities, especially State Watershed Protection Approaches.

- Describes the TMDL process as the technical backbone of the Watershed Protection Approach.
- Generally suggests that the TMDL process should uphold the purpose and intent of the Endangered Species Act.

Goal #3: Even and consistent application of Section 303(d), especially public involvement in the list development process.

- Encourages States and EPA Regions to follow guidance and communicate frequently to help assure consistency.
 - Encourages states to devise their own TMDL development methods and suggests EPA Regional Coordination assistance in cases where inconsistencies may arise in waters that flow through multiple States.
 - Clarifies that EPA expects all public participation requirements to be fulfilled prior to submittal of 1994 State lists.
- **August 9, 1996.** *EPA Action on 1996 Lists, Priority Rankings and TMDL Targeting Plans Submitted by States Under 303(d) of the Clean Water Act.* Memorandum from Robert Perciasepe (Assistant Administrator for Water) to Regional Administrators, EPA Regions I-X. (See TAB 10.)
 1. Outlines expected actions for Regional Division Directors to take regarding 1996 State Section 303(d) list submittals. Notes that some States had not submitted 303(d) lists by the April 1, 1996 deadline.
 2. Generally provides that if a State has not submitted its final list by October 31, 1996 (absent convincing extenuating circumstances), EPA regions should disapprove the State "nonsubmission" by December 15, 1996 and plan to propose an EPA list for that State by February 1, 1997.
 3. Indicates that EPA will produce a draft strategy for the future of the TMDL program by the fall of 1996.

How does the TMDL Program Relate to Other Clean Water Act Programs?

- **Watershed Protection.** EPA, States, and localities have established a variety of approaches to address water quality problems on a watershed level. (See TAB 11 for a copy of EPA's Watershed Protection Approach Framework and other information on watershed approaches and Background Paper #3 for a discussion of the Watershed Protection Approach (WPA).) These approaches range from the "Great Waterbodies Programs" authorized by Congress and led by EPA for the Great Lakes, the Gulf of Mexico, and the Chesapeake Bay, all the way to local stakeholder and "grass roots" efforts to protect and improve streams or lakes. The National Estuary Program, the Clean Lakes Program, and a wide variety of State watershed-based initiatives are other examples of watershed programs.

Watershed programs vary greatly, but most of them share the characteristics of encouraging broad stakeholder involvement, conducting broad assessments of water quality, identifying the stressors causing water quality problems (pollution, exotic species, hydromodification, over-fishing, etc.), developing action plans to address these problems, coordinating implementation of the action plans, and monitoring results. Some States employ a "rotating basin approach" to cover watersheds on a five-year schedule. These States use an iterative process of monitoring, assessment, problem identification, goal-setting, implementation, and reassessment.

Relation to the TMDL program: TMDLs can serve as the technical backbone to watershed approaches since they constitute the specific targets for applying water

quality standards to the watershed. Not all watershed approaches have been developed with Section 303(d) as their guide, however, so the existence of a watershed-based stakeholder group or a management plan for a watershed does not necessarily mean that TMDLs are being or have been developed. For example, some watershed approaches focus on implementing actions to achieve progress in improving the health of the watershed without first defining specific quantified goals in a TMDL. In some cases, stakeholders in the watershed may have agreed to implement controls or management measures that they consider feasible and that have proven effective in similar circumstances, even though the data and analysis to set a TMDL are not readily available.

- **Monitoring and Assessments.** State and Tribal environmental and natural resource agencies, EPA, the U.S. Geological Survey (USGS), the U.S. Department of Agriculture (USDA), the U.S. Forest Service (USFS), the Fish and Wildlife Service (FWS), the National Oceanic and Atmospheric Administration (NOAA), and a very large number of other State, Tribal and federal agencies all gather information on the physical, biological and/or chemical quality of our nation's waters. Local governments, businesses, academia, and citizens' groups also collect valuable water quality data, much of which is submitted to government agencies. EPA performs relatively little water quality monitoring itself but relies mainly on State, USGS, and NOAA data. In recent years, federal and State agencies have made significant progress in coordinating their monitoring activities and sharing information. Historically, however, States and federal agencies have employed a wide range of approaches to monitoring and assessment, so data may not be easily comparable.

Water quality information collected by private and public entities serves a variety of governmental purposes, including targeting program actions, determining compliance by regulated dischargers, assessing trends, determining whether actions taken or technologies employed are achieving desired results, and informing the public about water quality. Under Section 305(b) of the Clean Water Act, every two years, States submit information to EPA on the quality of the waters they have assessed. (States have assessed approximately one-third of their waters.) EPA compiles this information and other available information and, as provided by Section 305(b), transmits a biennial report on the nation's water quality to Congress. (See TAB 5 for a summary of the most recent Section 305(b) water quality report.)

Collecting and analyzing water quality samples is expensive and time-consuming. Agencies must target their monitoring activities to meet the most urgent needs for information. While a great deal of water quality information is available, information may be incomplete, out of date, or even unavailable for some waters.

Relation to TMDL program: Section 303(d) requires States and authorized Tribes to identify (or "list") waters for which technology-based point source controls will not assure attainment of water quality standards. EPA regulations clarify that other controls, such as nonpoint source controls, may also be considered. EPA regulations require consideration of all existing and readily available information in preparing Section 303(d) lists. If a State does not submit a timely Section 303(d) list to EPA or if the State's list does not meet federal requirements and is disapproved by EPA, then EPA must prepare the list for that State. In preparing 303(d) lists, States, Tribes and EPA generally rely on information supplied through the monitoring and assessment programs described above. (See also Background Paper #1, Listing of Impaired Waters, for a discussion of various Clean Water Act waterbody listing requirements.)

- **Water Quality Standards.** States and authorized Tribes are responsible for setting water quality standards to protect the physical, biological and chemical integrity of their waters. Standards include:

1. designated beneficial uses (such as drinking water supply, aquatic life protection, public recreation, etc.) for each water;
2. narrative and numeric criteria designed to protect the use; and
3. an antidegradation policy.

EPA issues "criteria guidance" on the human health and ecological effects of specific pollutants. These criteria are generally reflected in State standards. However, water quality standards vary considerably from State to State and Tribe to Tribe. EPA must also approve State and Tribal water quality standards and establish needed standards if the State or Tribe fails to do so. Most standards apply Statewide, although they may be specific to one or more waterbodies or even a small segment of a waterbody.

In recent years, EPA and States have been completing work on toxic pollutant standards and expanding efforts on other pollutants and ecological impacts. Scientific information is not yet available to support national criteria guidance or water quality standards for all stressors. Some important causes of water quality impairment (nutrients, for example) are not now addressed specifically in water quality criteria although they need to be addressed to meet other standards or criteria (dissolved oxygen goals, for example); others may be addressed by some States but not by others.

Quantifiable water quality goals are necessary to calculate TMDLs. Expressing State standards (particularly State narrative criteria and designated uses) in quantifiable terms is sometimes difficult technically due to limited scientific tools (such as modeling tools appropriate for local conditions), gaps in available data, seasonal variations, differences in background concentrations of pollutants, and the variety of biological characteristics in the affected waters, among other reasons.

Sometimes, in developing a TMDL, it becomes apparent that existing water quality standards are not appropriate for the watershed and that a site-specific revision to the standards is needed. For example, designated uses may need to be revised to reflect new activity in the watershed, additional pollutants may need to be addressed which were not previously known to be present, or criteria may need to be revised to protect local aquatic life that is particularly sensitive.

Generally, it is very difficult to make a case for relaxing existing water quality standards. For example, under EPA's regulations, a use designation may be removed only if (1) it is not an existing use and (2) it is not feasible to attain because of natural conditions, because of irreversible human-made conditions (such as certain hydromodification), or because widespread social and economic harm would result from actions needed to protect the use. Such determinations are based on "use attainability analyses" (UAAs). If a designated use or criterion is being added or revised, TMDLs may also need to be revised.

Relation to TMDL program: There are several key ways that the TMDL and water quality standards programs intersect. Standards are the basis for judgments about water quality impairment and for developing a TMDL. In deciding whether to list a water under Section 303(d), a State or Tribe determines whether water quality standards (designated uses and criteria) are being (or will be) attained through current control requirements. Then, in developing a TMDL for a listed water, the State or Tribe determines what amount of a pollutant may be added to the water while still assuring that a standard will be met, taking into account future growth, a margin of safety for uncertainty and other appropriate factors. Both of these

determinations require a quantified target based on relevant water quality standards.

- **National Pollutant Discharge Elimination System (NPDES) Permit Program.** Most States and a few Tribes are authorized to implement the Clean Water Act's NPDES point source permitting program. EPA is responsible for overseeing these programs and issuing permits in unauthorized jurisdictions. An NPDES permit is required for any discharge of a pollutant to a water of the U.S. through a human-made conveyance. Permits are issued to (among others) industries, municipal sewage treatment plants, some very small process waste dischargers, and large numbers of stormwater dischargers, including local governments that manage storm drain systems. General permits that cover classes of dischargers are sometimes issued to ensure consistency and program efficiency in permitting similar facilities. NPDES permits are issued for a term of up to five years, after which they must be renewed.

Generally, NPDES permits must contain effluent limits, schedules for compliance with new requirements, and monitoring and reporting provisions. Permit effluent limits must be based on a "technology-based" analysis and, where needed, a "water quality-based" analysis.

"Technology-based" effluent limits for industry must be at the level attainable with the "best available technology economically achievable" (BAT or BATEA) and/or, for some dischargers and some pollutants, the "best practicable technology" (BPT) or "best conventional technology" (BCT). For many industries, minimum technology-based requirements are set by EPA's national effluent guidelines. EPA has also defined minimum technology-based requirements (known as "secondary treatment") for municipal wastewater treatment facilities. For dischargers not covered by EPA's minimum requirements, permit writers generally make case-by-case determinations of what is the appropriate or "best" technology-based limit. While they are based on control levels achievable with existing technologies, technology-based limits are performance standards that allow the discharger to decide how to comply. Most point sources have had permits with technology-based limits since the 1980s, although these may be updated to address additional pollutants or newer technologies.

"Water quality-based" effluent limits are required when technology-based limits are not sufficient to achieve water quality standards. These limits are based on TMDLs and wasteload allocations (WLAs). Under the Clean Water Act, permit writers consider economic availability and practicability of controls in setting technology-based limits, but need not do so in setting water quality-based limits. (Costs and practicability may be considered in allocating load reductions in the TMDL, however.) There are very few opportunities for variances from water quality standards.

Relation to TMDL program: In determining whether an NPDES permit should include a water quality-based effluent limit for a particular pollutant, the NPDES permit writer (1) refers to an established TMDL and the specific wasteload allocation assigned to the permittee under that TMDL, or (2) calculates a water quality-based effluent limit for the discharger seeking the permit based on other available information. In this way, water quality standards are often achieved through NPDES permits for point sources. Under the Clean Water Act's "antibacksliding provisions", a permittee seeking a relaxation of a permit effluent limit may need to demonstrate that this can be done consistent with the TMDL. (See also the Nonpoint Source Management Program discussion below for a brief description of how nonpoint source loadings allocations may affect NPDES permit limits.)

- **Pretreatment Program.** Most industries discharge their wastewater to sewers rather than directly to streams, lakes, estuaries, or other waterbodies. The national

pretreatment program sets minimum requirements for dischargers to publicly-owned sewerage systems (known as "indirect dischargers") and requires larger municipalities to carry out local programs to regulate these dischargers. EPA has established national technology-based guidelines for many categories of industrial indirect dischargers. In addition to implementing these guidelines, municipalities with local pretreatment programs must ensure that their local indirect dischargers do not discharge pollutants that will:

1. pass through municipal treatment and cause violations of water quality standards in the receiving water, or
2. cause interference (such as equipment upsets) with municipal sewage treatment.

These are known as the "pass-through" and "interference" prohibitions.

Municipal pretreatment program requirements are included in the municipality's NPDES permit and are enforceable by EPA and States approved to implement the pretreatment program. Requirements for indirect dischargers may be enforced by EPA, States, and/or municipalities, depending on the circumstances.

Relation to the TMDL Program: Because TMDLs serve as the basis for establishing water quality-based permit limits, including those for municipal wastewater treatment plants, they will also drive limits for indirect dischargers, especially limits established to prevent "pass-through".

- **Nonpoint Source Management Program.** The nonpoint source management program under Section 319 of the Clean Water Act is implemented by States and authorized Tribes with technical and financial support from EPA. (See TAB 15 for additional information on Nonpoint Source Management Programs.) The program addresses dischargers not subject to NPDES permit requirements, such as run-off from farms, forests, and rangelands and water quality impacts from marinas, hydrologic modifications, and other water-based activities. Generally, state programs for nonpoint source management do not rely solely on the "command and control" (with federal oversight) approach used in the NPDES program. Instead, these programs rely upon an array of federal programs (including the Farm Bill and the Intermodal Surface Transportation and Efficiency Act) for cost-share and performance requirements, State-level enforceable requirements, and voluntary approaches based on education, technical assistance, funding, and other incentives. Generally, States have some enforcement authority over nonpoint sources, at least in cases of severe water quality impacts that have not been addressed despite efforts to assist and encourage improved management. (Such authorities are sometimes called "bad actor" provisions.) Some States have authority to enforce water quality standards directly against any person causing a violation.

Under Section 6217 of the 1990 Coastal Zone Act Reauthorization Amendments (CZARA), 29 coastal States and Territories are now developing coastal nonpoint pollution control programs, including enforceable policies and mechanisms. These policies and mechanisms are to ensure implementation of management measures to control nonpoint pollution from agriculture, forestry, urban development, marinas, hydromodification, and wetlands in targeted waters. EPA has issued guidance on the use of management measures for these categories. The State's enforceable policies and mechanisms can be State-level regulatory programs and requirements developed specifically for CZARA, or they may be existing, broad enforceable authorities to be used in combination with voluntary approaches.

Relation to the TMDL program: In deciding whether to list a water, States may need to determine whether existing Section 319 and/or CZARA programs will control nonpoint sources sufficiently and in time to eliminate the need for developing a TMDL.

If a TMDL is needed, it should be based on a consideration of all significant stressors and sources. However, States have discretion in allocating load reductions among sources contributing to the impairment. A State could allocate load reductions to multiple sources. However, a State could instead require a single point source to reduce its loadings sufficiently to meet the TMDL, and other point and nonpoint sources would not be affected. In some watersheds, however, this is not possible or is not considered to be desirable and nonpoint sources are assigned load reductions through the TMDL load allocation process.

EPA's 1991 guidance (see TAB 9) provides that if a point source NPDES permit limit is based on a wasteload allocation that relies on nonpoint source load reductions, then the NPDES permit record is to include (1) reasonable assurance that needed nonpoint source controls will be implemented and maintained, or (2) a monitoring program to demonstrate the nonpoint source load reductions. Assurances may include local ordinances, grant conditions or other enforceable conditions. NPDES permits may need to provide for more stringent limits on the point source if expected nonpoint source load reductions are not demonstrated.

A large number of waters on Section 303(d) lists are impaired due (or due partly) to nonpoint source-related impacts. Therefore, nonpoint sources often need to be considered in developing TMDLs and load allocations.

Total Maximum Daily Load (TMDL) Program



QUESTIONS ADDRESSED IN TMDL BACKGROUND PAPERS

OVERVIEW

1. What Does the Clean Water Act Say About TMDLs?
2. What is a Section 303(d) List?
3. What is a Total Maximum Daily Load (TMDL)?
4. What Regulations has EPA Issued to Implement Section 303(d)?
5. What Guidance has EPA Issued to Help States and Tribes Implement Section 303(d)?
6. How Does the TMDL Program Relate to Other Clean Water Act Programs?

BACKGROUND PAPER # 1

Listing of Impaired Waters

1. What are the requirements for State/Tribal Section 303(d) lists?
2. What is the current status of State submittal of Section 303(d) lists?
3. What data must be considered in developing Section 303(d) lists?
4. How can the need for consistent listing decisions be balanced with the need to consider local conditions?
5. How are Existing and Planned Controls Evaluated in Making Listing Decisions?
6. What is the relationship of the Section 303(d) List to other assessment activities required by the Clean Water Act?
7. How do States and authorized Tribes establish priority rankings for waters on the Section 303(d) list?
8. How can waters be removed from the Section 303(d) list?

BACKGROUND PAPER #2

Criteria for EPA Approval of State/Tribal TMDLs

1. What are the technical characteristics of approvable TMDLs?
2. What are the administrative requirements of approvable TMDLs?
3. What is the current status of TMDL development?
4. Is there a need to develop additional technical criteria for an approvable TMDL?
5. What is an appropriate pace for TMDL development?
6. How are waste load and load allocations determined?
7. Is implementation a required component of a TMDL?
8. Are any other efforts functionally equivalent to TMDLs?
9. How are pollution controls assessed and the adequacy of TMDLs determined?

BACKGROUND PAPER #3

Management of the TMDL Program

1. What are the public participation requirements for State and Tribal Section 303(d) lists and TMDLs?
2. How can the Section 303(d) program best provide for meaningful public participation?
3. What is the role of Tribal governments in implementing Section 303(d)?
4. What challenges does the program face with regard to the role of Tribes?
5. How can TMDLs best be developed for waters affected by federal lands?
6. How should TMDL activities be tracked and reported?
7. What are EPA's responsibilities for oversight and management of State and Tribal Section 303(d) listing and TMDL development activities?
8. What is the timeframe for EPA action on Section 303(d) lists and TMDLs?
9. How can TMDL activities be integrated with Performance Partnerships?
10. How can management of the TMDL program best support EPA, State and Tribal Watershed Protection Approaches (WPAs)?

BACKGROUND PAPER #4

Science and Technology

1. Science and Technology Overview
2. Technical Challenges Associated with TMDL Development
 - A. What is a measure of the designated use?
What challenges are presented by the
 - B. diversity of technical considerations in TMDL development?
Is there a single approved methodology
 - C. or set of techniques for addressing the components or steps of the TMDL process?

What are the implications of addressing
D. nonpoint source loadings within the
context of TMDL development?

What is the appropriate level of
E. complexity for development of a
TMDL?

Under what conditions may TMDL
development be limited by current
F. understanding of the technical
conditions and interactions between
loadings and water quality standards?

What are the challenges associated with
G. design and implementation of TMDL
monitoring programs?

What are the implications of evaluation
H. of management practices within the
TMDL development process?

Total Maximum Daily Load (TMDL) Program

Background Paper #1



Listing of Impaired Waters

1. What are the requirements for State/Tribal Section 303(d) lists?
2. What is the current status of State submittal of Section 303(d) lists?
3. What data must be considered in developing Section 303(d) lists?
4. How can the need for consistent listing decisions be balanced with the need to consider local conditions?
5. How are Existing and Planned Controls Evaluated in Making Listing Decisions?
6. What is the relationship of the Section 303(d) List to other assessment activities required by the Clean Water Act?
7. How do States and authorized Tribes establish priority rankings for waters on the Section 303(d) list?
8. How can waters be removed from the Section 303(d) list?

General Background

1. What are the requirements for State/Tribal Section 303(d) lists?

Section 303(d) of the Clean Water Act (See Tab 7) requires States and authorized Tribes to identify waters for which technology-based effluent limitations are not stringent enough to achieve applicable water quality standards, and to assign priority rankings based on the severity of pollution and intended uses of these waters. TMDLs are to be developed for listed waters.

EPA's Water Quality Planning and Management Regulation (40 CFR §130, see Tab 8) specifies several requirements for State Section 303(d) lists.

- Each State or authorized Tribe is required to identify "water quality limited segments" for which Federal technology-based controls, State, Tribal, or local effluent limitations or other pollution control requirements (e.g., best management practices) required by local, State, Tribal, or federal authority are not stringent enough to achieve water quality standards, including waters not meeting standards due to thermal discharges (40 CFR §130.7 (b)). Note that the regulation clarifies that effective nonpoint source management may exempt a waterbody from being listed.
- The list that identifies these waters (the list of waters still requiring TMDLs), is known as the Section 303(d) list. States/Tribes are required to submit Section 303(d) list updates every two years, and may submit these lists as part of their Section 305(b) water quality report, or under separate cover.
- Each State/Tribe must consider all existing and readily available data in assembling the Section 303(d) list (40 CFR §130.7). At a minimum this should include:
 - waters identified as impaired, threatened, or not meeting designated uses by other lists required by the Clean Water Act, such as the Section 305(b) report, and nonpoint source assessments, submitted to EPA under Section 319;
 - waters for which technical analyses (such as predictive modeling) show violation of a water quality standard;
 - waters identified by other information sources, such as academic institutions or members of the public, as not meeting water quality standards (the State/Tribe is directed to actively solicit entities for such information); and
 - threatened waters (waters that currently meet water quality standards, but that are not expected to in the near future).
- The Section 303(d) list must include (40 CFR §130.7):
 - a priority ranking of all listed waters and waters targeted for TMDL development within the next listing cycle (which are not necessarily "high priority" waters);
 - for each listed water, the pollutant(s) causing (or expected to cause) the

violation of water quality standards; and

- o documentation to support listing decisions, including a description of the methodology used, data evaluated, rationale for not using any readily available data, and any other reasonable information requested by EPA to evaluate the listing decisions.

Several guidance documents (see Tab 9) that EPA has issued since 1991 have clarified EPA's expectations for the content of Section 303(d) lists.

- EPA's guidance for 1994 list development (issued on November 26, 1993, see Tab 9) indicates that States/Tribes are expected to use a combination of the most reliable databases, best professional judgment, and the best available information to develop Section 303(d) lists, and recognizes that this combination will vary among States/Tribes.
- EPA's guidance for 1994 lists further indicates that water quality limited segments should be eliminated from consideration for the Section 303(d) list when Federal, State/Tribal, or local controls that will result in the attainment of applicable water quality standards are enforceable, specific to the pollutant/stressor, and stringent enough to meet applicable water quality standards within a reasonable time.
- The State/Tribal priority ranking (submitted as part of the Section 303(d) list) and the State/Tribal water quality management planning arrangements form the basis for the State/Tribe to target waters for TMDL development and submittal. The process for priority ranking should be described in the State's Continuing Planning Process (CPP) under Section 303(e).
- After receiving a final Section 303(d) list from a State or Tribe, EPA has 30 days to approve or disapprove the list. EPA considers a number of factors in this decision, such as whether the list includes the required components, the basis of listing decisions, and the process used to develop the list.

2. What is the current status of State submittal of Section 303(d) lists?

Section 303(d) of the CWA was enacted in 1972. Although some States submitted lists in the 1970s and 1980s, it was in 1992 that EPA's Water Quality Regulation, 40 CFR §130.7(d), required States to submit Section 303(d) lists to EPA for review every two years. EPA has issued several guidance documents (see Tab 9) that suggest procedures for States and authorized Tribes to use in developing their Section 303(d) list, as experience with the program has grown.

As of October 28 1996, there are five States for which EPA is initiating action to obtain approved lists by December 15, 1996. All other States already have approved lists or schedules to obtain approved lists by December 15, or later in the case of convincing extenuating circumstances (see Tab 10).

The number of waters listed by States varies greatly for several reasons, including variations in geographic size and the number and extent of surface waters. Some States choose to list larger watersheds, others list smaller stream segments. Differences in the availability of monitoring data and the scope and stringency of water quality standards are also factors, as are the types of sources present and the effectiveness of control actions to date.

Challenges Facing EPA, States, and Authorized Tribes

3. What data must be considered in developing Section 303(d) lists?

EPA regulation (40 CFR §130.7) requires States to consider all "existing and readily available" data in developing Section 303(d) lists. Although EPA has issued guidance suggesting what data States/Tribes should consider, there may be lingering questions as to what constitutes all "existing and readily available data," and whether there should be minimum quality standards for data that is used to support a listing decision. Should it be appropriate, for example, to use even somewhat questionable data when no better data are available? Some have suggested that a strict policy of data discrimination may provide a disincentive to gather good data. It is also unclear to what extent data "quality standards" can be properly defined.

EPA's guidance for 1994 lists (see Tab 9) describes what type of information should be considered in developing Section 303(d) lists. The guidance indicates that data selection is a deliberative process involving judgment, and offers specific examples of data that States/Tribes could use in developing the Section 303(d) list. Collecting and evaluating data of different types and varying quality is a crucial challenge in the Section 303(d) listing process, because of the technical difficulty involved, the cost of performing additional monitoring, and the effect of these determinations in determining "impairment" and priority ranking.

4. How can the need for consistent listing decisions be balanced with the need to consider local conditions?

Historically, there have been considerable differences among States in listing decisions. Variability in the numbers of waters listed is to be expected given differences in State size, base water quality conditions, and number and size of water bodies. However, some degree of variation may also be due to: (1) differences in the extent and type of water quality monitoring performed in the States; and (2) differences among States as to whether and how they evaluate the adequacy of existing controls.

Variability among States in Section 303(d) list development may reflect different State approaches to water quality planning and management (of which TMDLs are a component). However, it has been suggested that a greater degree of consistency among States in listing decisions would be desirable, as it would help to ensure fairness and national progress in TMDL development. More consistent criteria might also expedite EPA review and approval of State TMDL lists, and clarify the purpose and procedures of the TMDL program to stakeholders. Given the variability in State circumstances and programs, how could greater consistency be achieved?

5. How are Existing and Planned Controls Evaluated in Making Listing Decisions?

Federal regulations (40 CFR §130.7(b), see Tab 8) require States and authorized Tribes to list waters for which technology-based controls, State/local effluent limitations, or other pollution control requirements are not stringent enough to meet water quality standards. EPA's 1994 listing guidance (see Tab 9) indicates that water quality-limited segments need not be included on the Section 303(d) list if federal, State, Tribal, or local controls that will result in the attainment of applicable water quality standards are enforceable, specific to the

pollutant/stressor, and stringent enough to meet applicable water quality standards in the near future.

The guidance for 1994 lists also describes what might constitute "the near future." It suggests that for point sources, the inclusion of appropriate effluent limits in NPDES permits would provide adequate assurance that water quality standards will be met in a timely way. The guidance suggests that nonpoint source controls need a more thorough analysis of technical and implementation feasibility. More specifically, the guidance suggests that if planned nonpoint source controls are not expected to meet water quality standards by the next listing cycle (that is, in two years), the waterbody must be placed on the Section 303(d) list. Further, if the required control (point or nonpoint) is not yet implemented, the guidance suggests that the State/Tribe should submit an implementation schedule (for planned controls) to justify not including the waterbody on the Section 303(d) list.

In effect, EPA guidance provides that there may be some water quality-limited waters for which TMDLs are not needed because established control strategies will achieve water quality standards. One challenge to the TMDL program is to determine more specifically what types of existing and planned controls, especially for nonpoint sources, could eliminate the need for listing. A related challenge is to determine when (or whether) current or planned controls could allow a Section 303(d)-listed water to be removed from the list.

6.What is the relationship of the Section 303(d) List to other assessment activities required by the Clean Water Act?

Several lists and reports required by the Clean Water Act are important to consider in relation to Section 303(d) lists.

- Section 305(b) Water Quality Report: Submitted by States every two years, these describe the water quality of all navigable waters in a State.
- Section 319 State Nonpoint Source Assessment Reports: These State reports identify waters adversely affected by nonpoint sources of pollution. Initially completed in 1988/89, they may be updated from time to time. These reports are used to allocate federal funds to address nonpoint pollution.
- Section 314 Impaired Lakes Lists: These State lists cover publicly owned lakes for which uses are known to be impaired by point and/or nonpoint sources.

The list required by Section 303(d) is unique in that it is the only ongoing list with a direct link under the law to regulatory requirements for additional controls (for point sources) on listed waters.

EPA recognizes that there is likely to be significant overlap among waters appearing on the various lists and reports, and has suggested in guidance (1991 guidance, see Tab 9) that it is appropriate to use other lists and reports in assembling the Section 303(d) list. Some might argue that a single, consolidated assessment report would also present a number of technical and administrative challenges. The lists may involve different deadlines; they may be based on data of lower quality than that needed for Section 303(d); and they may in practice be submitted late or be incomplete.

In addition to reporting requirements, a related question is whether and how to consolidate the many assessment activities that occur under different sections of the Clean Water Act, as well as those that occur under other federal, State, and Tribal programs. For example, it has been

suggested that the assessment and reporting procedures for Section 305(b) reports should be changed from a two-year to a five-year cycle. It has also been suggested that it makes sense to consider changing assessment and reporting activities under Section 303(d) to a similar five year cycle, to facilitate the consolidation of these and other State/Tribal assessment and reporting activities. However, these activities are not identical and consolidation will require careful analysis.

7. How do States and authorized Tribes establish priority rankings for waters on the Section 303(d) list?

Section 303(d)(1)(A) (see Tab 7) requires States to establish a priority ranking for Section 303(d)-listed waters, taking into account the severity of the pollution and the uses to be made of such waters. The priority ranking is also to include a list of waters targeted for TMDL development over the next two years (until the next listing cycle). For example, States commonly categorize Section 303(d)-listed waters as "high," "medium," or "low" priority, although not all high priority waters are necessarily targeted for development during the next listing cycle. To date, EPA's policy and guidance has allowed flexibility to develop priority ranking and targeting components of the Section 303(d) lists to be consistent with State-specific strategic approaches, needs, and Water Quality Management Plans, as long as the general statutory requirements are met.

A supplemental EPA guidance memorandum dated August 13, 1992 (see Tab 9) indicates that priority ranking and targeting are dynamic, and may change from one two-year cycle to the next. Waters targeted for TMDL development should reflect the State's priority ranking of its waters. TMDLs should not be entirely excluded from development based on their difficulty or complexity. This is consistent with EPA's 1991 guidance, which also suggests that States should identify longer-range, multi-year schedules for TMDL development.

There are several challenges associated with priority ranking and targeting. These include how and to what extent States/Tribes should consider such factors as: data availability and quality; resource constraints; ability to solve known problems with existing tools (e.g., water pollution from air deposition); the possibility that new information or planned programs may achieve water quality standards; and the existence of an active watershed protection program that has stakeholder support (even though it may not meet the technical and administrative requirements of a TMDL). Another challenge may be to decide whether a State/Tribe should assign lower priority to a water for which new information is anticipated that may allow the water not to be listed? Such an approach might encourage more and better monitoring or even more rapid implementation of controls. On the other hand, this may delay action on some waters that have serious water quality problems.

8. How can waters be removed from the Section 303(d) list?

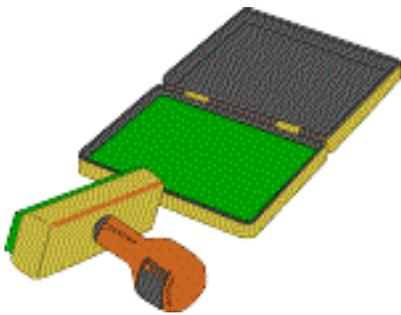
EPA's guidance for 1994 lists (see Tab 9) suggests that waters may be removed from the list under the following circumstances: (1) new information shows that "the original basis for listing is determined to be inaccurate;" or (2) EPA has approved a TMDL designed to achieve water quality standards. In this guidance, EPA Regional Offices were given the flexibility to determine whether States/Tribes should maintain waterbodies with approved TMDLs on their Section 303(d) lists until water quality standards are achieved, or allow waters with approved TMDLs to be removed prior to meeting water quality standards (if a tracking method to ensure that those waterbodies are making anticipated progress during TMDL development and implementation is in place).

It may be necessary to examine the conditions under which waters with approved TMDLs may be de-listed (when water quality standards are not met). De-listing rewards States and helps them demonstrate progress in TMDL development. However, what degree of assurance that

water quality standards will be met is needed in order to remove a water from the Section 303(d) list? If so, what does this imply regarding the desired components of an approvable TMDL?

Total Maximum Daily Load (TMDL) Program

Background Paper #2



Criteria for EPA Approval of State/Tribal TMDLs

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1. What are the technical characteristics of approvable TMDLs?
 2. What are the administrative requirements of approvable TMDLs?
 3. What is the current status of TMDL development?
 4. Is there a need to develop additional technical criteria for an approvable TMDL?
 5. What is an appropriate pace for TMDL development?
 6. How are waste load and load allocations determined?
 7. Is implementation a required component of a TMDL?
 8. Are any other efforts functionally equivalent to TMDLs?
 9. How are pollution controls assessed and the adequacy of TMDLs determined?

General Background

1. What are the technical characteristics of approvable TMDLs?

- A Total Maximum Daily Load (TMDL) reflects the total pollutant loading a waterbody may receive and still meet water quality standards.
- By statute (Section 303(d)(1)(C), see Tab 7) and regulation (40 CFR §130.7(c)(1), see Tab 8), TMDLs are to be developed for all waters on the Section 303(d) list, taking into account seasonal variations and a margin of safety (MOS) to allow for uncertainty.
- EPA's regulations at 40 CFR §130.2(i) (see Tab 8) define a TMDL as the sum of "waste load allocations (WLA)" (loads allotted to existing and future point sources) plus "load allocations (LA)" (loads allotted to existing and future nonpoint sources, plus loads from natural background) plus a margin of safety (MOS) to account for uncertainty. Mathematically, this is:

$$\text{TMDL} = \sum(\text{WLA}s) + \sum(\text{LA}s) + \text{MOS}$$

- TMDLs also may include a reserve for future growth, which can be a separate element in the mathematical expression above, or included in the waste load and load allocations.

EPA's guidance documents issued since 1991 (see Tab 9) clarify several characteristics of TMDLs.

- TMDLs can be expressed in terms of either mass per time, toxicity, or other appropriate measure that relates to a State/Tribe's water quality standard.
- EPA's 1991 guidance recommends that States/Tribes develop TMDLs on a geographic basis (e.g., by watershed). TMDLs may help drive State, Tribal, or local watershed plans.
- A phased approach can be used to develop TMDLs in cases where uncertainty is very high (1991 guidance). A TMDL developed using the phased approach contains all required TMDL elements and establishes a schedule for installation and evaluation of point and nonpoint control measures, data collection, and assessment of water quality standards attainment. The phased approach allows TMDLs to be developed without waiting for data to be collected and analyzed. It provides a mechanism for verifying expected load reductions, evaluating effectiveness of control measures, and, ultimately, for determining whether a TMDL needs to be revised.
- TMDLs consider all significant sources of the stressor of concern and identify the recommended approaches or controls for each source.
- While TMDLs include load allocations, they need not assign load allocations or load reductions to all known sources.
- TMDLs contain a quantified target or endpoint. However, there is flexibility in expressing quantitative measures (i.e., mass per unit of time, energy, toxicity)

depending upon the nature of the stressor.

- TMDLs can be developed to address any kind of stressor (e.g., sediment deposition, nutrient loading). Because a TMDL generally addresses a single stressor, several TMDLs are sometimes necessary to fully address a waterbody's problems.
- TMDLs should be supported by the best available scientific information.

2. What are the administrative requirements of approvable TMDLs?

- The Clean Water Act requires States to submit TMDLs to EPA for approval (Section 303(d)(1)(C), see Tab 7). In its review, EPA determines whether the State's TMDLs are sufficient to achieve the applicable water quality standards given seasonal variations and a margin of safety. EPA's 1991 guidance (see Tab 9) suggests that EPA may tailor its review of State-submitted TMDLs to what is reasonable and appropriate, and that States/Tribes should include in their TMDL submissions the proposed allocations and necessary supporting information. (See also Background Paper #3 regarding EPA oversight and actions on disapproved TMDLs).
- EPA expects States/Tribes to involve the public in establishing TMDLs. (August 13, 1992 supplemental guidance, Tab 9). At a minimum, TMDLs are to be made available for public comment (1991 guidance, Tab 9). (See also Background Paper #3 for a review of some public participation issues).
- EPA regulations (40 CFR §130, see Tab 8) state that the TMDL development process should be described in the State's continuing planning process (CPP) under Section 303(e) of the CWA. In addition, the regulations require EPA-approved TMDLs to be incorporated into a State's Water Quality Management Plan (WQMP). Thus, TMDLs should be integrated with other State water quality management activities.

3. What is the current status of TMDL development?

Many TMDLs have been developed since Section 303(d) was enacted in 1972. Most of these were for waters that were impaired primarily because of point sources, and were developed in the context of NPDES permits. In the 1970s and 1980s, EPA and States focused more on point sources (NPDES permits and construction of municipal treatment works) because these were the most obvious sources of pollution and the control mechanisms were technically and legally available. Many such TMDLs were completed prior to 1992, when EPA began to require States to submit biennial Section 303(d) lists.

In recent years, States have begun to focus on more complex TMDLs, such as TMDLs for waters impaired by nonpoint sources. Many of these TMDLs have proved to be very difficult and time consuming due to the limited scientific tools available. There is significant uncertainty in many aspects of TMDL development, such as linking loads to effects on water quality standards attainment, and estimating loads from nonpoint sources. There are no agreed-upon methods to develop TMDLs for some pollutants/stressors. Moreover, assigning load allocations and waste load allocations can be difficult. EPA has devoted significant resources to increasing technical knowledge, developing tools and methodologies, and documenting and distributing case studies. (See Background Paper #4.)

Challenges facing EPA, States, and Authorized Tribes

4. Is there a need to develop additional technical criteria for an approvable TMDL?

One challenge to the TMDL program may be to determine whether additional technical criteria are appropriate to define what is needed for an approvable TMDL. Section 303(d) of the Clean Water Act, current regulations, and guidance generally describe the elements of an approvable TMDL. More specific criteria may be desirable to facilitate consistent, equitable review and to ensure that TMDLs will result in the attainment of water quality standards. Specific criteria may be difficult to establish, however, given that TMDLs are to be completed for a wide variety of water quality stressors and waterbody types.

In addressing this challenge, it will be necessary to consider the tradeoff between more specific criteria for an approvable TMDL and allowing States/Tribes discretion to find creative ways to develop TMDLs that best address existing water quality problems. It has been suggested that some of EPA's current regulations and guidance may already constrain TMDL development unnecessarily in this regard.

5. What is an appropriate pace for TMDL development?

EPA regulations (40 CFR §130.7(c), see Tab 8) require States to develop TMDLs for Section 303(d) listed waters in accordance with the State's priority ranking. Consistent with the regulation, EPA has not established schedules for TMDL development. The pace of TMDL development is generally left to the State/Tribe, consistent with its overall water quality management activities and subject to EPA's ongoing responsibility to oversee authorized State/Tribal programs.

State TMDL development has proceeded relatively slowly in recent years, if viewed in terms of numbers of waterbodies some States have listed vs. number of TMDLs developed. Some might argue that it could be misleading to judge progress of the TMDL program by the pace of TMDLs completion. Other criteria to consider might include the quality of TMDLs developed, tools developed, controls being implemented, and water quality standards met. The slow pace of TMDL development may be due to many factors. TMDLs can be technically difficult to develop, given inherent uncertainties in relating loads to water quality standards and estimating loads from different sources (see Background Paper #4). Many Section 303(d)-listed waters are likely to require complex TMDLs. For some types of impaired waters, water quality standards may exist but numeric criteria are not yet developed, making TMDL development considerably more difficult. Finally, EPA, States, and Tribes have limited staffing, expertise, and resources to devote to the TMDL development process.

Some have argued that the pace of State development of TMDLs could and should be accelerated, and that government should assign higher priority to this effort. Increased experience with the program, new analytical tools and better dissemination of technical information may allow for TMDLs to be developed faster. Perhaps TMDLs could be produced more quickly if technical precision were not required or if a broader definition of TMDLs were embraced. However, it is unclear what pace of TMDL development is feasible and appropriate, given the requirements for approvable TMDLs, other program commitments, and existing State/Tribal and EPA capacity.

It has been suggested that since TMDLs do not have a direct regulatory effect (except through NPDES permits), they should not be a high priority, especially in watershed impaired mainly by nonpoint sources. On the other hand, it has been argued that nonpoint source management programs should be guided by TMDLs and load allocations.

A related challenge may be to investigate other possible mechanisms that may affect the pace of TMDL development. For example, some have suggested that EPA develop and apply a "no new sources" policy--to not approve any new NPDES permits for listed water quality limited segments until a TMDL is in place--to assure that the impairment does not become worse, and also to provide an incentive to increase the pace of TMDL development.

6. How are waste load and load allocations determined?

Section 303(d) of the CWA and the Water Quality Planning and Management regulation (40 CFR §130, see Tab 8) do not specify the basis of waste load allocations (to point sources) and load allocations (to nonpoint sources). EPA guidance leaves judgments about allocations entirely to the States/Tribes. Leaving such discretion to States/Tribes allows for the differences among State/Tribal water quality programs and problems, and the States' and Tribes' more in-depth knowledge about local factors that may affect the allocation decisions. States/Tribes may wish to promote a particular approach or philosophy to load allocation. Some examples of different allocation approaches include:

- Approaches which emphasize ease of enforcement and/or certainty of results (technical feasibility). These approaches tend to rely on achieving more load reductions from point sources, because it is usually easier to develop enforceable requirements for point sources through the NPDES permit program. In addition, there is generally more certainty about results achievable with point source controls than nonpoint source controls.
- Approaches which emphasize equity of load reduction responsibility. These approaches might lead to an allocation of roughly equal percentage load reduction among all sources, perhaps taking into account load reductions already achieved.
- Approaches emphasizing cost-effectiveness. This approach would suggest an allocation scheme that enables the TMDL to be achieved at the overall least cost to "society."
- Approaches based on some other conception of "fairness." These approaches might be subjective, and could vary: some might argue that those sources that reap proportionally more of the benefits of water quality improvement might need to reduce loads more (or pay more of the costs); others might argue that fairness implies requiring more load reductions from those that have the "ability to pay;" and others might argue that fairness implies putting more emphasis on nonpoint source controls, because point sources have had to bear much of the load reduction responsibility in the past.

7. Is implementation a required component of a TMDL?

Implementation of a TMDL sometimes refers simply to setting waste load and load allocations and establishing a margin of safety so that water quality standards are met. However, the

question above relates to how the allocations to sources are actually achieved. This question is not specifically addressed in Section 303(d) of the CWA, nor in EPA's regulations except in the context of NPDES permits for point sources. Neither the statute nor the regulations gives EPA, or the States, or Tribes specific implementation authority or responsibility to establish controls to achieve TMDLs. General authority may be provided elsewhere, such as in the Farm Bill, the Intermodal Surface Transportation and Efficiency Act (ISTEA), and existing State/Tribal and local requirements.

The 1991 guidance (see Tab 9) suggests that an implementation schedule (a timetable for the installation and evaluation of point and nonpoint source control measures) be part of a TMDL developed using the phased approach. Existing guidance documents, however, do not require that an implementation plan for TMDLs to be approvable. A draft supplemental guidance document circulated in 1994 (see Tab 9) suggests that an implementation schedule (which includes anticipated control measures and a schedule for their implementation) should be part of a TMDL submittal, but EPA has never issued nor implemented this draft guidance, and it may not reflect current EPA thinking.

Although it might appear desirable from the perspective of attaining water quality standards, implementation of a TMDL may not be possible or reasonably likely without establishment of new State/Tribal authorities, and no explicit federal statutory or regulatory authority exists to require that States/Tribes adopt such authorities. In addition, requiring an implementation schedule as part of a TMDL may greatly delay development and approval of TMDLs. Clearly, a challenge to the TMDL program is to ascertain whether TMDLs should contain any implementation components.

Implementation may require sophisticated (and time-consuming) coordination with a myriad of federal, State, Tribal, and local agencies and programs. State forest practices, laws, local zoning boards, habitat conservation plans under the Endangered Species Act, federal land management programs, and Tribal economic development plans are among the many potential implementing authorities. How can the TMDL program best work with these other programs?

This is one of the most important questions for the TMDL program since the time and resources required to develop a TMDL may not contribute to water quality improvement without a strong focus on implementation.

8.Are any other efforts functionally equivalent to TMDLs?

Some have suggested that certain federal, State, Tribal, or local efforts are functionally similar to a TMDL, and could substitute for a TMDL in certain instances. For example, perhaps Habitat Conservation Plans (HCPs) geared to aquatic species under the Endangered Species Act might be integrated with (or even serve as) TMDLs for nonpoint sources. In addition, many State or local watershed protection approaches may have similar elements to TMDLs. Capacity constraints may make it attractive to recognize these efforts as TMDLs. However, given legal requirements as well as differences in the scope and purpose of these various programs, integration or TMDL-substitution may be difficult or controversial.

9.How are pollution controls assessed and the adequacy of TMDLs determined?

The 1991 guidance (see Tab 9) discusses the "assessment of water quality-based control actions." This involves data collection and monitoring to evaluate whether the TMDL and

control actions based on the TMDL have been sufficient to attain the water quality standards.

The 1991 guidance suggests that TMDLs developed using the phased approach should include a schedule for data collection and assessment, including a monitoring program (if none exists). However, there are no statutory or regulatory requirements that approvable TMDLs contain assessment mechanisms. A challenge may be to ascertain how to best assess the results achieved by TMDLs. For example, should an approvable TMDL include an assessment schedule?

Total Maximum Daily Load (TMDL) Program

Background Paper #3



Management of the TMDL Program

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1. What are the public participation requirements for State and Tribal Section 303(d) lists and TMDLs? How can the Section 303(d) program best provide for meaningful public participation?
 2. What is the role of Tribal governments in implementing Section 303(d)? What challenges does the program face with regard to the role of Tribes?
 3. How can TMDLs best be developed for waters affected by federal lands?
 4. How should TMDL activities be tracked and reported?
 5. What are EPA's responsibilities for oversight and management of State and Tribal Section 303(d) listing and TMDL development activities?
 6. What is the timeframe for EPA action on Section 303(d) lists and TMDLs?
 7. How can TMDL activities be integrated with Performance Partnerships?
 8. How can management of the TMDL program best support EPA, State and Tribal Watershed Protection Approaches (WPAs)?

1. What are the public participation requirements for State and

Tribal Section 303(d) lists and TMDLs? How can the Section 303(d) program best provide for meaningful public participation?

An opportunity for public participation is required in the Section 303(d) listing process and in TMDL development. Public participation requirements include three main elements: public notice and comment, public consultation, and responsiveness summaries (40 CFR Part 25).

- **Public Notice.** Public notice with a minimum 30-day comment period is required when a proposed list or TMDL has been established. The location of data, reports and other relevant information must be provided. Public notice for Section 303(d) actions can be combined with public notices for other water program activities.
- **Public Consultation.** In any "significant action", public consultation is required. This may apply to some TMDL actions. Public consultation may include public hearings, public meetings, advisory groups, task forces, workshops, and/or informal communications. Significant actions are those which draw a great deal of attention or directly affect numerous persons or organizations. Public hearings are held at the discretion of the State/Tribe, or EPA if EPA is taking the action.
- **Responsiveness Summaries.** Upon completing the public participation process, responsiveness summaries are to be prepared. These identify public participation activities, summarize the comments made, and set forth the modifications accepted or explain rejection of the suggestions received. Public participation activities must also be described in the State Continuing Planning Process (CPP).

In addition, EPA guidance states that public participation is important throughout the listing process. EPA guidance (see TAB 9) also provides the following:

- States and Tribes are to complete the public participation process before submitting final Section 303(d) lists. EPA will not approve a list until the State/Tribe has conducted public review and comment. If EPA conditionally approves a list, the revised list must also satisfy the public participation regulations.
- EPA must complete the public participation process if the State/Tribe does not.

For the 1996 listing process, most States have completed or are in the process of completing public participation. (See TAB 10 for the most recent EPA headquarters status report on listing actions.)

EPA publishes a variety of reports on water quality and EPA Regional Offices often share information on local water quality with the public in a variety of forums. A key element of EPA's recent Healthy Watersheds Strategy (see TAB 11) is to use the internet to enhance public involvement in protecting water quality by providing access to environmental information about the individual watersheds and communities. EPA is working to make water quality information available through a homepage called "Surf Your Watershed". Additional enhancements are planned.

Building public support for watershed protection activities is an outgrowth of successful stakeholder involvement and public education and outreach. This may require intense local efforts of coordination and communication, tailored to local conditions. As TMDL development processes take place across the nation, how can States, Tribes and EPA Regional Offices best engage stakeholders and the public in the TMDL process?

While the listing and TMDL development processes are likely to be most successful over the long term if stakeholders are involved in and committed to the process, TMDL development has been slow and the pace may need to be increased to meet legal requirements and assure continued progress in water quality improvement. What public involvement approaches can the States/Tribes and EPA use to ensure that effective stakeholder involvement takes place within the necessary tight timeframes for the listing and TMDL development processes?

A great deal of environmental and water quality data can be delivered via the internet, with much of it capable of being georeferenced to the specific watershed or community where a person lives. As EPA and States put this type of data on the internet, how can they help ensure that this technology will help and encourage citizens to take a more direct role in water quality planning and management decisions, including specific listing and TMDL development processes?

It is sometimes difficult for citizens to participate effectively in a process that involves highly technical issues. What, if any, responsibilities do EPA, the States, and Tribal governments have to ensure that stakeholders have access to technical expertise so that they can participate more effectively?

2. What is the role of Tribal governments in implementing Section 303(d)? What challenges does the program face with regard to the role of Tribes?

In 1994, Carol Browner, EPA Administrator, reaffirmed the agency's policy regarding its trust responsibilities to Tribes and the government-to-government relationship between EPA and Tribal governments. (See TAB 14 for a copy of this policy.)

The CWA, Section 518, provides for EPA to authorize Tribes to carry out certain provisions of the Act, including Section 303, on Tribal lands. The CWA also requires EPA to promulgate regulations specifying how Tribes can qualify for the CWA programs.

Where Tribes are not yet authorized or choose not to assume a certain program, EPA is responsible for implementation on Tribal lands. If a Tribe wishes to do so, it may enter into agreements with States to assist with implementing environmental programs.

Several Tribes have been authorized to implement the water quality standards program under Section 303 of the CWA. In recent years, federal courts have reviewed and upheld Tribal water quality actions in a variety of circumstances. For example, a recent federal district court decision (3/27/96, Montana v. EPA) has affirmed EPA's view and the rulings of other courts that a Tribe may be treated in the same manner as a State for purposes of setting water quality standards. The Montana case specifically affirmed that a Tribe can be authorized to set water quality standards that will affect all reservation residents, whether or not they are Tribal members.

Although a number of Tribes have been authorized to implement the water quality standards program under Section 303, their role in the Section 303(d) TMDL program is not as clear. EPA's regulations specifying how Tribes could assume the water quality standards program did not specify how a Tribe can be authorized to implement the TMDL program. However, some Tribes that have been authorized to carry out Section 303, may be undertaking implementation of Section 303(d).

What priority should EPA give to promulgating regulations pertaining to Tribal authorization for Section 303(d)'s TMDL activities? Are some Tribes willing and able to take on this responsibility at this time? What support can/should EPA provide to Tribes in listing and TMDL development efforts? What tools, training and resources can be provided to help Tribes that want to implement the program? What can/should be done to foster Tribal involvement in TMDL development?

How will EPA carry out its responsibility for implementing the TMDL program on Tribal lands where authority has not been requested by or granted to the Tribe? Where Tribes desire State assistance, what can the States do?

How can Tribal governments best participate in State TMDL development activities that affect Tribes (e.g., TMDLs for waters with treaty-protected fishing rights outside reservation boundaries, Tribal waters downstream from the watershed for which a State is developing a TMDL)? Should there be special participation mechanisms for Tribes, beyond those required under the public participation provisions for the listing and TMDL process, especially where States and Tribes share responsibility in a watershed?

3. How can TMDLs best be developed for waters affected by federal lands?

The challenge of developing and implementing TMDLs affecting federal lands is of particular importance to western States and Tribes, where many watersheds may consist largely of federal lands.

Current EPA Nonpoint Source Program and Grants Guidance (May 1996) directs States to identify federal lands and activities which are not managed consistent with State nonpoint source program objectives. EPA plans to publish additional guidance that promotes consistency of federal lands activities with State water quality program objectives, including the TMDL program.

How should States and Tribes treat Section 303(d)-listed waters comprised mainly of federal lands in terms of priority ranking and targeting? Is there a need for additional EPA involvement in TMDL development for waterbodies affected by federally-owned lands? If so, what can or should EPA do in this regard?

Agencies such as the Forest Service, Park Service, and Bureau of Land Management often have their own watershed management plans and activities, which may be similar to the TMDL process. How can these activities best be integrated with State and Tribal TMDL development activities required by Section 303(d)? To what extent, if any, can or should these plans and activities be treated as equivalent to the TMDL process in satisfaction of Section 303(d)?

4. How should TMDL activities be tracked and reported?

- Section 303(d) Lists: States may submit Section 303(d) lists either as part of or at the same time as their biennial Section 305(b) water quality reports. States and authorized Tribes are to identify waters targeted for TMDL development in the following two years. Targeted waterbodies are then generally scheduled for TMDL development through the annual work plan.

- TMDL Development. States and authorized Tribes also submit to EPA for approval or disapproval the TMDLs they have developed, along with supporting information.

States and authorized Tribes are also to establish and maintain a Continuing Planning Process (CPP). (See CWA Section 303(e), in TAB 7.) A State's CPP is to contain, among other items, descriptions of the processes for listing, TMDL development, and public participation.

States have been establishing TMDLs (mostly in connection with point source permits) since the early 1970s, but national tracking of TMDLs was minimal until recently. Around 1992, EPA increased its tracking efforts by beginning to collect a broader range of information and tracking the progress of scheduled TMDLs on an individual basis.

What are the primary objectives for tracking and reporting, and what do they imply for the information that should be reported, and the level of detail, frequency, and consistency of reporting by States and Tribes? Should EPA do more to monitor State/Tribal TMDL activities given the delays in meeting Section 303(d) requirements?

5. What are EPA's responsibilities for oversight and management of State and Tribal Section 303(d) listing and TMDL development activities?

For any final State or Tribal Section 303(d) list or any State or Tribal TMDL submitted for approval, EPA must either approve or disapprove within 30 days after submittal from the State or Tribe. If EPA disapproves a State or Tribal submission and the State or Tribe does not agree to correct the problems, then EPA must, within 30 days, establish the list or TMDLs as necessary to implement water quality standards. EPA prefers to work cooperatively with States and Tribes to resolve listing and TMDL issues.

In its review of Section 303(d) lists, EPA considers a number of factors, such as whether the list includes the required components, the basis of listing decisions, and the process used to develop the list. (See Background Paper #1 and the EPA guidance documents in TAB 9.) Based on its review, EPA can approve, disapprove, partially approve, or conditionally approve the list.

In its review of a TMDL, EPA determines whether it is sufficient to meet water quality standards. (See Background Paper #2, EPA Criteria for Approval of State/Tribal TMDLs). EPA may conduct an in-depth review of only a sample of the State's TMDLs if the State has described its TMDL process in its approved CPP and EPA/State Agreement. For those States that do not have an approved process, EPA Regions are expected to conduct in-depth reviews of all TMDLs.

Several legal challenges to EPA's listing or TMDL approval decisions have been filed in federal court. In the case of *Sierra Club, et al. v. Hankinson* (U.S. District Court for the Northern District of Georgia, March 25, 1996), the court found (among other things) that EPA's failure to disapprove Georgia's TMDL submission was arbitrary and capricious and that EPA's failure to promulgate TMDLs for Georgia violated the CWA. (See TAB 12 for a copy of this and certain other relevant court decisions and a summary of the status of Section 303(d)-related litigation.)

Is EPA doing enough to highlight the need for States to meet their obligations under Section 303(d)? How can EPA best work cooperatively with States to ensure that Section 303(d) listing and TMDL requirements will be met? Should EPA periodically conduct audits of State water quality programs to determine where additional training or other assistance may be needed and to ensure high quality of lists and TMDLs? From an environmental protection perspective, is it wise for EPA to focus its limited resources on States where lawsuits seeking EPA promulgation of lists and/or TMDLs have been filed?

6. What is the timeframe for EPA action on Section 303(d) lists and TMDLs?

The CWA sets tight timeframes for EPA's approval or disapproval of Section 303(d) lists and TMDLs, and for EPA to take its own actions following disapproval. EPA headquarters' Office of Water recently set internal management deadlines for EPA Regional Offices to act on 1996 lists. (See the 8/9/96 memorandum in TAB 10.) The deadlines are for States to submit final lists by October 31; for EPA Regional Offices to disapprove in the case of State nonsubmission of lists by December 15th; and, for those lists which EPA disapproves, for EPA Regional Offices to propose an EPA list within thirty days of disapproval or by no later than February 1, 1997. The Office of Water plans to provide direction soon on EPA actions following disapproval of a State or Tribe's TMDL.

How can EPA keep States and Tribes fully involved in the TMDL program and still take action itself where necessary to meet legal requirements and environmental needs? Can an "early warning system" be developed to help States, Tribes and EPA anticipate problems in meeting deadlines for lists? If EPA disapproves a number of State Section 303(d) lists or TMDL proposals, what level and pace of EPA action can realistically be expected, given statutory timeframes and EPA's resource constraints?

7. How can TMDL activities be integrated with Performance Partnerships?

The National Environmental Performance Partnership System (NEPPS), signed by the Administrator and State environmental program leaders in 1995, gives State/Tribal programs more leeway to set priorities, design new strategies, and manage their own programs, and aims to better focus EPA technical assistance and oversight. Under that system, Performance Partnership Agreements (PPAs) and Performance Partnership Grants (PPGs) are flexible and cooperative approaches to State/EPA work planning and grants management for all EPA programs.

This new model for EPA programmatic relationships with States and Tribes focuses on targeting activities that will produce the greatest environmental benefits and sharing responsibility for accomplishing agreed upon goals. EPA's historic approach was to award program funding to States/Tribes only through categorical grants for specified programs or activities, along with specific conditions tied to programmatic outputs and specific limits on eligible activities. In PPAs and PPGs, EPA is emphasizing flexibility for States and Tribes, allowing them (among other things) to combine grants and integrate programs in order to direct resources more efficiently to the most significant environmental problems. EPA, States, and Tribes will need to consider how they can use these flexible workplan and funding mechanisms to help achieve the TMDL program's objectives.

8. How can management of the TMDL program best support EPA, State and Tribal Watershed

Protection Approaches (WPAs)?

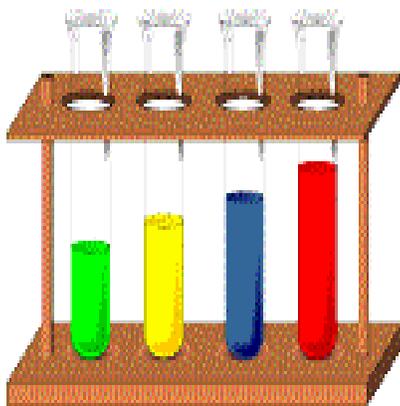
For the past several years, EPA and many States and Tribes have been promoting the watershed protection approach (WPA) in protecting and managing water quality. Many States have been using the WPA to re-orient water quality programs. (See TAB 11 for a discussion of EPA's WPA policy.)

Significant gaps have been identified in past efforts to protect watersheds from the cumulative impacts of multiple activities. The WPA focuses on the highest priority problems within hydrologically-defined geographic areas. While State, Tribal and local WPAs vary, they usually strive to achieve partnerships with stakeholders, a specific geographic focus, and sound management based on strong science. The WPA can be contrasted with past efforts that focused more on specific pollutants or specific sources.

TMDLs have been called the "technical backbone" of the WPA. Section 303(d) lists can drive or reflect State and Tribal watershed priorities. How can the TMDL process best work with the WPA to assure progress in priority watersheds as well as satisfaction of the requirements of Section 303(d)?

Total Maximum Daily Load (TMDL) Program

Background Paper #4



Science and Technology

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1. Science and Technology Overview
 2. Technical Challenges Associated with TMDL Development
 - What is a measure of the designated use?
 - What challenges are presented by the diversity of technical considerations in TMDL development?
 - Is there a single approved methodology or set of techniques for addressing the components or steps of the TMDL process?
 - What are the implications of addressing nonpoint source loadings within the context of TMDL development?
 - What is the appropriate level of complexity for development of a TMDL
 - Under what conditions may TMDL development be limited by current understanding of the technical conditions and interactions between loadings and water quality standards?

Science and Technology Overview

The fundamental concepts of the TMDL process, from listing to implementation, are grounded in a technical framework. The science and technology underpinning this program are used to evaluate the processes and interrelationships which represent our understanding of the environmental systems. Ultimately, TMDLs are designed to assure that waterbodies meet water quality standards. Water quality standards have three components including designated beneficial uses, narrative and/or numeric criteria, and an anti-degradation policy. Analytical procedures and evaluations are performed in support of TMDL development to develop appropriate load allocations which will result in compliance with all three components of water quality standards.

TMDLs require that a waterbody meet its designated use. The basis for achievement of a designated use (i.e., fishing, swimming) is the determination and allocation or distribution and implementation of an acceptable load. Simply stated, to develop a TMDL one must first determine what is causing the problem, evaluate how much loading is acceptable, determine the loads from each source (e.g., point and nonpoint sources), and distribute the allowable load between the various sources and the MOS. The load can be a pollutant or other stressor such as phosphorus, a toxic, or sediment. The TMDL process also expects that the accuracy of the estimates be recognized in the Margin of Safety (MOS), which is a safety factor to account for the uncertainty associated with developing TMDLs. Each of the components described involves a technical step or judgment. The TMDL program has given States the flexibility to develop these technical judgments on a site-specific basis using scientifically defensible techniques.

A TMDL is the basis for developing a permitting and related pollution abatement action plan. Cost associated with a TMDL includes the analysis phase (i.e., data collection, analysis, modeling, allocations) and the implementation (i.e., treatment plan upgrades, nonpoint source BMPs). The allocation determined by the TMDL may require the upgrade of controls on point source discharges or installation of nonpoint source controls or best management practices (BMPs). The higher the cost of the implementation, the more stringent the expectations are for the technical accuracy and defensibility of the analysis. The TMDL analysis must have a reasonable scientific basis in order for allocations to be accepted by the local community and other stakeholders. This scientific basis can be difficult to substantiate in areas where research is ongoing and relationships between loadings and impacts to water quality standards are poorly defined. The scientific adequacy of the analysis used to develop a TMDL is evaluated during the TMDL approval process.

The guidance for TMDL development, and TMDL development to date, has endorsed a site-specific approach. There are broad guidelines for the components of the TMDL, including the determination of quantitative endpoints and estimation of the allowable load. However, the selection of the specific analytical approach is done considering site-specific loading and waterbody conditions and cost implications. This site-specific approach, selected and implemented by the TMDL developer, results in a custom design for each individual TMDL. Since 303(d) listed waters include the full range of conditions throughout the United States (including various waterbody types, types of problems, and sources) the selection and execution of appropriate analytical techniques range from simple to complex depending on the individual case.

Technical support provided by EPA for the TMDL program has included a combination of training courses, technical support documents, and technical review and consultation services. TMDL specific training courses (3-day) have been offered at seven regional locations over the past 3 years. These training courses include a combination of programmatic and technical lectures and hands-on components. Technical support documents have included a series of case studies, technical notes, reviews of models and tools, and technical guidance for specific

waterbodies and stressors. Technical documents are distributed in hard copy and via bulletin board services and internet. Ongoing guidance development includes preparing step-by-step how-to guides for four key stressor types and waterbodies (i.e., nutrients, bacteria, sediment, and dissolved oxygen under variable flow conditions), continued development of case study examples, and the development of Internet-based information/bibliographies. The TMDL program also coordinates with other programs on guidance development for related issues such as watersheds, lakes, estuaries, toxics, and nutrients, and other conventional pollutants. A summary of available TMDL-specific guidance documents is shown in Table 1.

Limited technical review and consultation is also provided through the EPA TMDL surface water action team (SWAT). This group of experts is available, upon a State/Regional request, to review, recommend, and evaluate scientific and technical aspects of a TMDL development effort. The SWAT team is not tasked with completing the TMDL but rather with assisting and supporting the development process. Typical requests are limited to 40 hours of consultation. Over the past four years approximately 6-18 requests have been addressed per year.

Broader technical support, related but not specific to the TMDL program, is offered by EPA, including specific computer model training courses (i.e., SWMM, HSPF, WASP5, QUAL2E, CORMIX), model distribution and enhancements, and technical guidance documents. Historically, model development, distribution, technical support, and training was provided through EPA's Office of Research and Development (ORD) Center for Exposure Assessment Monitoring (CEAMS). In recent years this support has been reduced to distribution of selected models and very limited technical support for model related questions. Over the past three years EPA's Office of Science and Technology (OST) has provided support by offering selected courses in HSPF (4), SWMM (2), QUAL2E(3), WASP(1), CORMIX (6). Courses have been limited in size (approximately 30 participants per course) and the relatively few number of courses do not meet the overall demand for training. The EPA has not been able to offer a standard set of courses on a routine basis due to funding limitations. EPA has investigated the use of alternative media (i.e., video, multi-media, and internet) to reach a broader audience and accommodate a range of technical levels (from beginner to advanced).

EPA OST has supported development of windows-based interfaces for models such as SWMM, SWRRB, and QUAL2E. EPA has also increased efforts to distribute modeling tools and guidance via the Internet. A comprehensive list of public domain or readily available models and tools is provided in the Compendium of Watershed-scale Models for TMDL Development and the Watershed Tools Inventory (also available via Internet). Although models are distributed by EPA free of charge, users are provided with very limited technical support. Since model applications may require a high degree of expertise, lack of technical support can result in difficulties in application of models. EPA has also developed integrated tools which provide preliminary data, analysis tools, and models within a single system. EPA developed the Watershed Screening and Targeting Tool (WSTT) to support simplified analysis techniques and targeting procedures and has sponsored the development of a new GIS-based tool (BASINS) to provide users with a package for addressing a variety of TMDLs. New training courses are planned for fiscal year 1997 to provide basic training in the application of BASINS for TMDL development.

Technical Challenges Associated with TMDL Development

- **What is a measure of the designated use?** This challenge is centered on the formulation of State water quality standards and designated uses. In some cases a direct violation of numeric water quality standards is the cause for listing a waterbody under '303(d). In other cases a narrative or qualitative measure (such as assuring the preservation of habitat is the basis for listing. These qualitative measures need to be translated into a measurable target for development of a TMDL. A measurement such as pounds of phosphorus is needed before the load can be

distributed among the various sources. Some lists include problems which do not readily relate to a simple measurement of condition (i.e., sediment-related problems) or problems for which there is not clear precedent or an accepted approach.

- **What challenges are presented by the diversity of technical considerations in TMDL development?** TMDLs cover the complete range of waterbody types (i.e., rivers, streams, lakes, estuaries), stressors (i.e., nutrients, toxics, sediment, acidity), and sources (i.e. agriculture, urban, hydromodification, and mining). It is precisely this diversity of conditions that can make TMDL development for selected stressors difficult. The scientific background for any one condition can fill a bookcase and is still evolving. Our understanding of the complex interrelationships between various stressors is still growing as well, and is a fruitful area of research. Technical support and training funds are insufficient to fully address the range of diversity presented by the TMDL program. Although the 1978 Federal Register describes TMDLs as appropriate for all pollutants, practical considerations may dictate that not all cases are currently amenable to TMDL development.
- **Is there a single approved methodology or set of techniques for addressing the components or steps of the TMDL process?** The diversity and site-specific nature of problems and waterbody types precludes the development of a single method. In some cases, for a specific waterbody type/pollutant, a simplified technique could be endorsed by EPA. Development of a such a standard method could greatly simplify the decision-making and custom the development process for each TMDL. However, the use of a prescribed method could also result in lower accuracy, less recognition of site-specific conditions, and limited consideration of more complete interrelationships. Simplified analysis may in some cases result in recommendations for large load reductions (and subsequently high cost for treatment). The development of a core set of accepted methods is also difficult in the face of the diversity of needs. Simplified methods are not available or technically defensible for a large number of TMDL problem types such as rivers with sediment problems.
- **What are the implications of addressing nonpoint source loadings within the context of TMDL development?** The integration of nonpoint source loadings into TMDL development requires a different approach than those typically employed in traditional point source evaluations. Nonpoint sources generally deliver loadings to waterbodies during rain events. Rainfall can cause erosion of sediment and runoff which transports a variety of pollutants. The integration of time-varying nonpoint sources and more constant point sources has been an ongoing challenge of the TMDL program. The majority of the existing technical guidance and reports examine traditional low flow conditions where point sources dominate. The experience, case studies, and technical guidance for evaluating the conditions where nonpoint source problems occur, is still evolving.
- **What is the appropriate level of complexity for development of a TMDL?** As there is increased pressure to complete TMDLs in a timely and cost-effective manner, the obvious conclusion is to use the simplest methods possible. Very simple calculations, with appropriate assumptions, can and have been used to develop TMDLs. In some cases the concept of a phased approach has been employed, where a simple analysis is used initially and follow-up monitoring has been used to confirm or refine the analysis at a later date. The challenge is to define when a simple analysis is appropriate, sufficient, and technically defensible. However, the level of analysis should be commensurate with the cost of controls and the certainty in effect of controls. In some cases the simplifying assumptions may disregard key features and processes of the system resulting in inadequate solutions or low accuracy.
- **Under what conditions may TMDL development be limited by current understanding of the technical conditions and interactions between loadings and**

water quality standards? Certain types of water quality problems and processes are still poorly understood. For example, excessive nutrients in rivers can cause the growth of attached algae. The relationship between nutrient loading and attached algal growth is very difficult to quantify and therefore definition of an acceptable load and determination of a TMDL is problematic. A variety of technical needs currently exist that limit the ability to develop TMDLs. The EPA Regions recently identified the following high priority needs:

- Techniques and guidance are needed to assess and manage impairments caused by excessive loadings of uncontaminated sediments
- New or enhanced models are needed to better predict dissolved oxygen concentrations in streams and lakes and to better assess dissolved oxygen problems in urban environments under varying flow conditions. Guidance is also needed to better incorporate consideration of varying flow conditions into TMDL development.
- Better tools and procedures are needed to assess and model bacteria and other related stressors, especially under high flow conditions and for agricultural and urban areas.
- Guidance is still needed on the determination of nonpoint source loadings from urban and rural areas. Techniques for quantifying uncertainty and integrating loads with downstream impacts are needed.
- Techniques and procedures are needed for the determination of site specific quantitative endpoints which are protective of physical habitat stressors (e.g. temperature, habitat, or sediment loading adversely impacting fish spawning and rearing).
- For some priority pollutants, monitoring techniques and cost limit the ability to adequately assess waterbody conditions. Monitoring of certain pollutants (e.g. metals) require clean techniques which prevent cross contamination due to improper collection and processing of the samples. In some cases historic monitoring data may be suspect due to the sampling procedures employed. In other cases the detection limit for the specific pollutant exceeds the actual water quality standard.
- **What are the challenges associated with design and implementation of TMDL monitoring programs?** Monitoring is needed to collect data for TMDL development, evaluate environmental improvement, and support future analyses as appropriate. General guidance is available on monitoring. However, the following challenges are a concern: there is no specific guidance on recommending minimum needs, not all types of problems are understood, selection of appropriate measures is not always clearly defined, and cost of monitoring data collection and processing is high.
- **What are the implications of evaluation of management practices within the TMDL development process?** Evaluation of management techniques and expected load reductions is inexact. In some cases quantifying the benefit in terms of load reduction from the installation of BMPs is difficult to determine. For certain types of BMPs limited data is available on their effectiveness in reducing pollutant loadings. Once expected removals are estimated it may be determined that management sufficient to meet water quality standards will require excessive expenditure. Other BMP design constraints may increase BMP installation/maintenance costs, such as limited space, high land values, and structural management construction costs. The challenge is to determine when TMDL implementation is warranted based on cost

and technical defensibility.
